

DOCUMENT RESUME

ED 209 276

TM 810 769

AUTHOR Pascale, Pietro J.
TITLE Evaluation Report for Project Year I of "Relating Mathematics to the Middle School Child's Real World".
PUB DATE 79
NOTE 39p.
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Elementary School Mathematics; Formative Evaluation; Junior High Schools; *Learning Modules; *Material Development; *Mathematical Applications; Mathematics Achievement; School Attitudes; *Summative Evaluation
IDENTIFIERS Canfield Local School District OH; *Mathematics Skills

ABSTRACT

In "Relating Mathematics to the Middle School Child's Real World", multi-faceted learning kits were developed, piloted, field tested, and revised. The kits make heavy use of games, simulations, practical applications of real world math skills, and other activity-oriented strategies. They use a learning cycle approach to help students improve their skills and attitudes, and teachers their awareness and appreciation, of the use of math in the real world. The summative focus of the evaluation is the pretest-posttest assessment of student performance in mathematical concepts and problem solving as measured by the Iowa Tests of Basic Skills, and attitudes and interest toward mathematics as measured by the Attitude/Interest Towards Math Scale. Year I findings indicated that exposure to kits developed from student need and interest produced statistically significant gains between target group and a matched comparison group on both mathematical problem solving skills and attitude/interest toward mathematics. (Author/BW)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

ED209276

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

- ☐ This document has been reproduced as received from the person or organization originating it.
- ☒ Minor changes have been made to improve reproduction quality.
- Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

EVALUATION REPORT FOR
PROJECT YEAR I OF
"RELATING MATHEMATICS TO
THE MIDDLE SCHOOL CHILD'S
REAL WORLD"

79-D-58-2

Dr. Pietro J. Pascale
Youngstown State University

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

P. J. Pascale

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

TM 810769

TABLE OF CONTENTS

	Page
I. Project Abstract	1
II. Evaluation Results	
A. Summary of Evaluation Procedure	2
B. Objective Achievement Summary	6
III. List of Tables	10

PROJECT ABSTRACT

Primary Target Population
Canfield Middle School Students
Grades 6, 7, and 8

Number Served 583

SUMMARY DESCRIPTION

The project resources will be used to develop, pilot, field test, and revise multi faceted learning kits designed to be used in self-contained classrooms, learning centers, in the home, or in classrooms of other disciplines with the help of volunteer, parent or teacher facilitators. The kits will make heavy use of games, simulations, practical applications of real world math skills, and other independent, small and large group activity oriented strategies. The kits will help students (remedial through gifted) improve their skills and attitudes and teachers their awareness and appreciation of the use of math in the real world. The kits will use a learning cycle approach, be built around basic mathematics operations and identified student need.

MAJOR OBJECTIVES

The primary objectives for the continuation project year 2 are both student and teacher oriented. Student objectives call for the improvement of skills and attitudes in the use of real world mathematics by providing them with kit related learning experiences. Target student populations with accompanying matched control group populations will be assessed in the middle school grades of 6, 7, and 8 at Canfield Middle School and at a field site in another Mahoning County school. Teacher objectives require improved attitude, awareness, and kit utilization as measured by inservice evaluations.

ACTIVITIES TO ACHIEVE OBJECTIVES

The following are some of the major activities of this project: 1) The revision, "re-localization" and field site testing of phase I kits produced in project year 1; 2) The development of piloting of phase II kits at Canfield Middle School; 3) The development of field testing of a teacher inservice training component for kit implementation; 4) The development and field testing of teacher awareness and understanding of real world appreciation of mathematics.

EVALUATION STRATEGY

The summative focus of the evaluation is the pretest-posttest assessment of student performance in mathematical concepts and problem solving and attitude and interest toward mathematics as measured by the Iowa Test of Basic Skills and Attitude/Interest Towards Math Scale. The formative focus for student performance includes accompanying facilitating objectives which will be rigorously measured by criterion referenced scales. The summative focus for teacher change in awareness will be the significant measured increase assessed by pretest-posttest measures.

EVALUATION FINDINGS

Year 1 findings indicated that exposure to kits developed from student need and interest produced statistically significant gains between target group and a matched comparison group on both mathematical problem solving skills and attitude/interest toward mathematics.

EVALUATION RESULTS

Summary of Evaluation Procedures

There were two performance objectives for Project Year 1. Performance Objective 1 involved the assessment of cognitive growth in mathematical problem solving and was supported by four facilitating objectives. Performance Objective 2 involved the assessment of attitude/interest toward mathematics and was supported by one facilitating objective.

Table 1 outlines the evaluation procedures for Performance Objective 1 along with the four facilitating objectives. Table 2 outlines the evaluation procedures for Performance Objective 2 along with the one facilitating objective.

Performance Objective 1

Given at least twenty hours exposure to project developed learning kits, target population students will show an average growth of at least 50% of the discrepancy between their functional grade level equivalent in mathematical problem solving and their potential grade equivalent.

Mathematics problem solving ability was measured by subtest M-2 of The Iowa Test of Basic Skills (ITBS). M-2 raw scores were converted to grade equivalents and potential grade equivalent was determined by the Horn-Reisman formula using the IQ data. Essentially what the Horn-Reisman formula does is to relate achievement to aptitude (measured IQ). A computer program was developed which gave individual student print-outs showing the discrepancy between actual and potential achievement. All Middle School students were administered the ITBS M-2 subtest and underachieving students were posttested with the same instrument. The criterion for this performance objective is that targeted underachieving students will reduce by 50% their discrepancy between grade equivalent and potential grade equivalent as indexed by the Horn-Reisman formula which uses chronological age and IQ data.

A second mode of analysis for determining the success of Performance Objective 1 was a comparison between a matched control group and treatment group. The basis of the matching was the pretest ITBS M-2 scores, IQ data, and attitude/interest toward math scores (AIMS). Students were posttested with the appropriate alternate form of the ITBS M-2 subtest. Data were punched on cards and statistical means were calculated. A t-test was used to demonstrate any significant difference between the mean of the control group and the mean of the experimental group (the group with students receiving a minimum of 20 hours interaction with the project developed learning kits in mathematical problem solving stressing real life situations).

Facilitating Objective I (for Perf. Obj. 1)

The Executive Planning Team (EPT) will design and describe a sequential series of practical mathematical application kits according to a pre-identified grid of basic mathematics strands or operation.

A review of the literature through a computer search called PROBE in the area of math kits was conducted as well as a search of NIE product catalogues with the purpose of locating existing curriculum materials and/or kits. Several experts in the area of math education were interviewed. The consensus of opinion was that there was not an identifiable existing set of kits even approximating what the present proposal was seeking to develop.

The data needed for evaluating this objective are 1) the item analysis from the M-2 problem solving subtest, 2) the student responses on the Student Topical Interest Inventory, and 3) the evaluation team responses on the Rating Scale for Kit Sequence. The project evaluator designed the ten item rating scale from the criteria specified in the proposal. The evaluation team members individually made ratings with the standard being a total average of 5 points with no rating less than 4 in each category.

Facilitating Objective II (for Perf. Obj. 1)

The EPT will design and implement a series of inservice workshops which will facilitate project staff - year 1 in constructing and implementing the first phase of the kit sequence.

The project evaluator developed two inventories for assessing the knowledge and skills of project staff. The Inventory of Teacher Skills in Kit Implementation was based on the document, Self Appraisal in the Middle School by the Pennsylvania School Study Council. The Inventory of Teacher Skills in Kit Development was designed by the project evaluator in collaboration with members of the EPT who had extensive experience in learning materials development. The EPT reviewed the data from the two inventories and planned workshops based on the teacher self-report responses. The EPT selected workshop leaders and participated in the development of measurable objectives for the workshops. The project evaluator collected and analyzed the workshop evaluation forms filled out by workshop participants. Each workshop was planned around specific measurable objectives.

Facilitating Objective III (Perf. Obj. 1)

The project staff - year 1 (at least twelve teachers) of Canfield Middle School (CMS) will contract for and construct phase I of a sequential series of practical mathematics application kits.

The project evaluator developed a 15 item rating scale called a Kit Evaluation Rating Scale based upon the eight specific criteria listed in the proposal and also including 7 items based upon the evaluator's review of the instructional design literature. The criterion for success was set as a minimum rating of 5 on each of the 15 items of the seven point descriptive rating scale. Each member of the evaluation team rated each kit using the Kit Evaluation Rating Scale.

Facilitating Objective IV (Perf. Obj. 1)

The project staff will pilot phase 1 of the Kit Series with target population students so that they receive 20 hours of instruction using the project developed mathematics kits.

The purpose of this facilitating objective was to systematically assess the scope of kit usage. The extent of kit implementation was verified by a tally of teacher kept logs and use of the Kit Implementation Log of the math specialist.

Performance Objective 2

Given at least 20 hours exposure to project developed learning kits, phase I target population students (approx. 25% of CMS in grades 6, 7, 8) will score significantly higher than a matched control group on the posttest of the AIMS.

The purpose of this objective was to measure student change on the attitude/interest towards mathematics scale in order to determine if exposure to kits shows more attitude/interest toward mathematics. A matched control group design was used (as mentioned in Performance Objective 1 above). The AIMS was administered pretest - posttest to 117 students. A t-test was used to compare posttest means of the treatment group (20 hours minimum use of kits) and the control group (regular instruction in math).

Facilitating Objective I (Perf. Obj. 2)

The EPT will select an appropriate attitude/interest toward math scale which will have these characteristics: 1) Likert format, 2) contain 20-30 items to insure adequate reliability, 3) contain validity evidence, and 4) contain language relevant to middle school students.

For choosing the attitude scale the project evaluator designed a short rating scale using as items those elements listed as criteria in the proposal objective. The project evaluator conducted a review of the literature of math attitudinal self-report instruments. The purpose of this facilitating objective was to find an existing attitude instrument or to revise/develop one from public domain published materials.

OBJECTIVE ACHIEVEMENT SUMMARY

Performance Objective 1

Given at least 20 hours exposure to project developed learning kits, target population students will show an average growth of at least 50% of the discrepancy between their functional grade level equivalent in mathematics problem solving and their potential grade equivalent.

A total of sixty one percent of the students identified as underachievers were able to progress 50% of the discrepancy between their functional grade equivalent and their potential grade level equivalent as estimated by the Horn-Reisman formula using age and IQ as determining factors. The reason for the relatively low number of 83 was that a similar number of underachieving students were needed for the matched comparison control group required by proposal changes suggested by the initial proposal review team.

The breakdown by grade level shows:

- 1) 55% of grade 6 underachievers
- 2) 64% of grade 7 underachievers
- 3) 62% of grade 8 underachievers

progressed 50% of the discrepancy between functional grade level as measured by ITBS M-2 (problem solving) grade equivalent and potential grade level as predicted by the Horn-Reisman formula.

The second mode of analysis (see Table 1) for assessing student achievement in the area of mathematical problem solving showed that the experimental group scored significantly higher than the matched comparison group. Table 3 shows the mean, standard deviations, and sample sizes of both the M-2 and the AIMS data for the total group. The M-2 raw scores were converted to standard scores and therefore grades 6, 7, and 8 could be statistically combined. The mean for the experimental group was 105.09 while the mean for the control group was 99.66. A t-test was used to test the statistical difference between the two means. The t value of 2.95 was significant at the .01 level of probability. There was no statistical difference between the experimental group and the control (matched comparison) on the IQ variable and on both the pre-test M-2 and pretest AIMS variables. Therefore, the results indicate the efficacy of the project developed materials in producing significant gains in students' mathematical problem solving skills as measured by the ITBS M-2 subtest.

Technically speaking, performance objective 1 was not achieved since not all targeted students progressed 50% of growth toward potential. However, about six out of every ten underachievers (about 62%) were able to reduce by 50% their discrepancy between grade level and potential grade level. Furthermore, actual interaction with project developed materials did not occur until late in the academic year.

Since there were two modes of analysis for performance objective 1, the interpretation of the data warrants careful qualification. The t-test analysis of the means of the comparison group and the treatment group (labeled experimental in Table 3) clearly indicates that the project developed materials were effective in producing increased student achievement in the area of mathematical problem solving. The full anticipated growth toward potential may be attainable if project developed materials were implemented earlier and for a longer period of time. What we may have is simply a dosage problem (as it is stated in other disciplines). Simply stated, we know from the data that the kits produced are efficacious and we suggest "more of the same."

The following evaluation data are unequivocal. All facilitating objectives were met and performance objective 2 dealing with student increase in attitude/interest towards math was also met.

Facilitating Objective I (Per. Obj. 1)

The Student Topical Interest Inventory was administered to all middle school students and the five higher ranking themes were Cooking, Rock & Roll, Major Seasonal Sports, Water Sports and Wheels. These five themes were then developed into five current kits.

The item analysis of the ITBS was conducted and a general analysis revealed variations in mathematical skills at the different grade levels. However, there were common weaknesses across grade levels - percent, ratio, and measurement. In-depth analysis of the solution process of the individual test items of the ITBS M-2 subtest revealed the weak areas to be:

1. Division (any type of rational number)
2. Fractions (subtraction problems involving unlike denominators and multiplication)
3. Decimals (all operations)
4. Percentage
5. Ratio and Proportion
6. Measurement

These data were incorporated into the Instructional Activity Specification Guideline Chart. The project evaluator constructed Rating Scale for Kit Sequence (Table 4) which was used to assess the completion of this facilitating objective. All criteria elements of the rating scale were met. There was extensive planning evident in the development of the kit sequence on the basis of both item analysis data and the student interest inventory data. Facilitating objective I was met. Extensive tables based on the item analysis ITBS M-2 were included in the monthly report of October, 1978.

Facilitating Objective II (Perf. Obj. 1)

The EPT will design and implement a series of inservice workshops which will facilitate project staff - year 1 in constructing and implementing the first phase of the kit sequence.

The knowledge and skill levels of project were assessed by two instruments - the Inventory of Teacher Skills in Kit Development and the Inventory of Teacher Skills in Kit Implementation. These two in combination provided a quasi-needs assessment for workshop planning. The project evaluator rank ordered the responses of both instruments and the EPT used these data to develop the Inservice Workshop Sequence. The project director stressed the importance of measurable objectives to workshop leaders and participated in the formation of measurable objectives for all workshop activity. All workshop objectives were met. Workshop evaluations were included in the appropriate monthly reports. Tables 5, 6, and 7 present a sample of the evaluation summaries of workshops. Facilitating objective II was met and there was strong evidence of extensive workshop planning and good coordination of workshop activity particularly in the area of specific kit development meetings.

Facilitating Objective III (Perf. Obj. 1)

The project staff - year 1 (at least twelve teachers) of the Canfield Middle School (CMS) will contract for and construct phase I of a sequential series of practical mathematics application kits.

This objective deals with the successful production of the five kits by involving at least 25% or 12 middle school staff members. Each member of the evaluation team independently rated the five kits using the Kit Evaluation Rating Scale (see Table 8). Since all criteria met the standard of a minimum of 5 on the 7 point descriptive scale, facilitating objective 3 was met. Copies of the composite tallies were included in monthly reports and are not included here because of space limitations.

Facilitating Objective IV (Perf. Obj. 1)

The project staff will pilot phase I of the Kit Series with target population students so that they receive 20 hours of instruction using the project developed mathematics kits.

The teacher kept logs of kit usage indicated that virtually all underachieving students in the experimental interacted with project developed materials at the specified minimum of 20 hours. The project director and math specialist participated in the tally of counts of teacher and student use of kits. Facilitating objective IV was met since virtually every student received a minimum of 20 hours of documented interaction with project developed

Facilitating Objective 1 (Perf. Obj. 2)

The EPT will select an appropriate attitude/interest toward math scale which will have these characteristics: 1) Likert format, 2) contain 20-30 items to insure adequate reliability, 3) contain validity evidence, and 4) contain language relevant for middle school students.

The project evaluator conducted a search of the literature of math attitudinal self report instruments. Over 30 such instruments were reviewed in collaboration with both the math specialist and the math educational consultant. The 30 instruments were reduced to 5 which could be appropriate to a middle school audience. The project evaluator developed a rating scale based on the criteria listed in the proposal. Analysis of the 5 attitude scales by the evaluation team showed that all scales (Dutton, Aiken, Suydam, Kish, and Taylor) had marginal validity, reliability, and norms information. The modified Dutton scale appeared to have the best format and appropriate reading level. It received the highest summated composite rating and therefore was selected for project use (see Table 9 for AIMS). Subsequent reliability testing showed a reliability coefficient of .89 ($r=.89$) using test-retest procedures using a small group of middle school students of another school ($N=48$). The evaluation team concluded they had the best psychometric scale considering project specification. Therefore, facilitating objective 4 was met early in project year 1.

Performance Objective 2

Given at least 20 hours exposure to project developed learning kits, phase 1 target population students will score significantly higher than a matched control group on the posttest of the AIMS.

The purpose of this objective is to assess student change in attitude/interest towards math. Students were pretested and posttested with the AIMS (as well as ITBS and M-2, see above). The AIMS pretest was used as one of the matching variables for the comparison group. There were no significant differences in IQ, AIMS, and ITBS M-2 scores between the experimental group (those receiving the kits) and the comparison group (those not receiving the kits). For all practical and statistical purposes the two groups were equivalent on the pretests. The AIMS posttest was administered in late May, 1979. Table 3 presents the posttest results. As a group those students using the kits scored significantly higher on the AIMS than those students not using the kits. Table 3 shows a mean AIMS score of 95.75 for the experimental group and a mean of 90.21 for the matched comparison (control) group. The t-test was used to statistically compare the two means. The t-value of 3.11 was significant at the .01 level of probability. Therefore, performance objective 2 has been met. The data clearly show that exposure to kits developed from student need and interest will be effective in increasing student attitude/interest toward math as measured by the AIMS.

LIST OF TABLES

Table 1	Evaluation Design for Performance Objective 1 and supporting facilitating objectives
Table 2	Evaluation Design for Performance Objective 2 and supporting facilitating objective
Table 3	Posttest Data for M-2 and AIMS Scores
Table 4	Rating Scale for Kit Sequence
Table 5	Evaluation Results of First Workshop
Table 6	Evaluation Results of Second Workshop
Table 7	Evaluation Results of Third Workshop
Table 8	Kit Evaluation Rating Scale
Table 9	Attitude/Interest Toward Math Scale (AIMS)
Table 10	Inventory of Teacher Skills in Kit Development
Table 11	Inventory of Teacher Skills in Kit Implementation
Table 12	Instructional Activity Specification Guideline Chart
Table 13	Student Topical Interest Inventory

TABLE 1 EVALUATION DESIGN FOR PERFORMANCE OBJECTIVE 1

PERFORMANCE OBJECTIVE 1		FACILITATING OBJECTIVES			
		Objective I	Objective II	Objective III	Objective IV
1. Evaluation Information Needed	Student achievement in mathematics problem solving and IQ Data	Item analysis report of subtest M-2 of Iowa Test of Basic Skills	Teacher perception of workshop utility	Composite rating of kits by members of evaluation team	Extent of kit implementation
2. Purpose of Information	To determine growth toward <u>potential</u> grade equivalent	To determine critical areas of student need in math problem solving	To assess workshop success	To determine adequacy and completeness of kits	To assess the scope of kit usage
3. Means and Source of Acquiring Information	Subtest M-2 of the Iowa Basic Skills Test	Computer printout from County Board of Education	Workshop participants use Workshop Evaluation Form and Inventory of Teacher Skills	Each member of evaluation team reviews kit materials and rates according to criteria	Examine pilot logs
4. Means of Analyzing and Reporting Information	Discrepancy between grade equivalent and potential grade equivalent on pretest compared with discrepancy on the posttest. Also T-test between matched control group and treatment group on posttest of ITBS M 2	Item analysis data to be used in forming grid. Grid assessed by rating scale developed by project evaluator	Average scores of each item on rating form - review content analysis of all volunteered comments	Minimum of five on each item of 7-point descriptive scale	Tally of counts of teacher use and student use documentation that kits were implemented as planned using pilot observation checklist
5. Dates of Information Collection	Pretest in October 1978 Posttest in May 1979	September 1978	At the end of each workshop	End of March 1979	June 1979
6. Persons Responsible for Analyzing & Reporting Information	Project Evaluator analyzes data and reports data to Director	Project Evaluator	Project Evaluator for Workshop Evaluation Data	Evaluation Team	Project Director

TABLE 2 EVALUATION DESIGN FOR PERFORMANCE OBJECTIVE 2

	PERFORMANCE OBJECTIVE 2	FACILITATING OBJECTIVE FOR PERFORMANCE OBJECTIVE 2
1. Evaluation Information Needed	Student changed in Attitude/Interest Toward Mathematics	Psychometric Information (validity, reliability, etc.) of selected Attitude/Interest toward mathematics scales
2. Purpose of Information	To determine if exposure to kits results in increased attitude/interest toward mathematics	To determine the most appropriate attitudinal scale from a psychometric point of view.
3. Means and Source of Acquiring Information	Treatment group and matched control group to be administered attitudinal scale pre-test and post-test	Test manual and reviews of the Attitude/Interest toward mathematics scale found in research reports or journals
4. Means of Analyzing and Reporting Information	A T-test will be used to compare means of the treatment and control groups at the .05 level of probability	Use of rating scale developed by project evaluator
5. Dates of Information Collection	Pre-test in September 1979/Post-test in May 1979	Collate psychometric data and use rating scale by September 1978
6. Persons Responsible for Analyzing Reporting Information	Project Evaluator Analyzes Data and Reports Data to Project Director	Project Evaluator

TABLE 3

POSTTEST DATA FOR M-2 AND AIMS SCORES

	N	$\bar{X}$	S.D.	t
AIMS:				
CONTROL	121	90.21	14.44	t=3.11
EXPERIMENTAL	121	95.75	12.76	S
M-2:				
CONTROL	121	99.66	13.72	t=2.95
EXPERIMENTAL	121	105.09	14.61	S

RATING SCALE FOR KIT SEQUENCE

TABLE 4

	virtually no evidence	some evidence	modest effort	less than adequate needs more work	adequate	excellent/ some revision	exemplary
1. To what extent have the kit themes been based on documented student interest? Comments:	1	2	3	4	5	6	7
2. To what extent have critical needs as identified by the item analysis data been incorporated into the master plan of kits? Comments:	1	2	3	4	5	6	7
3. To what extent does the kit sequence contain a balance among basic mathematical operations? Comments:	1	2	3	4	5	6	7
4. To what extent does the kit sequence make adequate provision for use in multiple settings? Comments:	1	2	3	4	5	6	7
5. To what extent does the kit sequence make sufficient provision for use by resource people? Comments:	1	2	3	4	5	6	7
6. To what extent does the kit sequence provide for articulation with other curriculum areas? Comments:	1	2	3	4	5	6	7
7. To what extent does the kit sequence provide for differentiation of content to provide for individual differences? Comments:	1	2	3	4	5	6	7
8. To what extent does the kit sequence make explicit the applications of mathematics to real-life situations? Comments:	1	2	3	4	5	6	7
9. To what extent does the kit provide for differences in student reading ability? Comments:	1	2	3	4	5	6	7
10. To what extent does the kit reflect curriculum guide continuum of difficulty? Comments:	1	2	3	4	5	6	7

TABLE 4
(continued)

11. To what extent is a rationale presented -
how and why the kit was generated?

Comments:

12. To what extent is there explanation of how
to use the kit (functions, effective settings)?

Comments:

13. To what extent is there appropriate record
sheets and other learning management devices?

Comments:

14. To what extent does the placement test serve
as a skill survey test with purpose of indicating
strand student should begin study?

Comments:

15. To what extent is each activity controlled by
an objective which is keyed to a mathematical
strand?

Comments:

	virtually no evidence	some evidence	modest effort	less than adequate needs more work	adequate	excellent; some revision	exemplary
11.	1	2	3	4	5	6	7
12.	1	2	3	4	5	6	7
13.	1	2	3	4	5	6	7
14.	1	2	3	4	5	6	7
15.	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7

EVALUATION RESULTS OF FIRST WORKSHOP

WORKSHOP THEME:

Providing Programmed and Individualized Materials on Varying Levels of Difficulty - Operational Skills

OBJECTIVES:

1. Workshop participants will recall and list the three types of subtraction problems.
2. Workshop participants will give written examples of story problems involving the three types of subtracting problems.
3. Workshop participants will recall and list two types of division problems.
4. Workshop participants will develop a story problem involving a division operation.
5. Workshop participants will list three ways of expressing fractions.
6. Workshop participants will name one game appropriate for illustrating multiplication of whole numbers.
7. Workshop participants will define the term "programmed" with reference to mathematics materials.
8. Workshop participants will list numerical examples of "regrouping" in addition.

EXPECTED PROFICIENCY LEVEL:

Each objective will be correctly answered by 80% of workshop participants.

RESULTS:

All objectives were answered correctly by more than 90% of workshop participants.

EVALUATION REMARKS:

All eight objectives were met to a substantial degree.

TABLE 6
EVALUATION RESULTS OF SECOND WORKSHOP

WORKSHOP THEME:

Coordinating a Multi-Media Approach with Behavioral Objectives

OBJECTIVE:

Workshop participants will demonstrate their knowledge of the use of media production equipment by correctly answering at least eight of ten multiple choice questions dealing with the use of (1) Drymount Laminator, (2) DIAZO Transparency Maker, (3) Gestetner Binding Machine, and (4) Wizard Table Top Laminator.

EXPECTED PROFICIENCY LEVEL:

Each participant will score minimum of 80%.

RESULTS:

Average score for all participants was 82. Several participants did not reach criterion because of missing item #2 dealing with dry mount laminating.

EVALUATION REMARKS:

With clarification of some minor details of the dry mount laminating process, this objective will have been met. Workshop participants, however, did demonstrate proficiency in the use of (1) Drymount Laminator, (2) DIAZO Transparency Maker, (3) Gestetner Binding Machine and (4) Table-Top Laminator.

18
TABLE 7
EVALUATION RESULTS OF THIRD WORKSHOP

WORKSHOP THEME:

Stating Behavioral Outcomes for Learners of Varying Abilities

OBJECTIVES:

1. Workshop participants will recall and list the names of the four components of performance objectives.
2. When given written definitions of the four components of performance objectives, workshop participants will supply the names of these four components.
3. Given segments of different performance objectives, workshop participants will correctly identify the names of the indicated component of the performance objective.

EXPECTED PROFICIENCY LEVEL:

Each objective will be correctly answered by 80% of workshop participants.

RESULTS:

Objective 1	85% correct
Objective 2	90% correct
Objective 3	85% correct

EVALUATION REMARKS:

The three objectives were met well beyond anticipated proficiency level.

TABLE 8

KIT EVALUATION RATING SCALE

	<i>virtually no evidence</i>	<i>some evidence</i>	<i>modest effort</i>	<i>less than adequate; needs more work</i>	<i>adequate</i>	<i>excellent; some revision</i>	<i>exemplary</i>
1. To what extent does the kit address itself to a critical need? Comments:	1	2	3	4	5	6	7
2. To what extent does the kit contain provision for choice of problems to be solved? Comments:	1	2	3	4	5	6	7
3. To what extent does the kit present real life situations in the context of mathematical problem solving? Comments:	1	2	3	4	5	6	7
4. To what extent does the kit provide for differences in student reading ability? Comments:	1	2	3	4	5	6	7
5. To what extent does the kit contain provision for use in multiple settings? Comments:	1	2	3	4	5	6	7
6. To what extent does the kit use a learning cycle approach? (i.e., pretest, posttest, alternative modes of instruction, etc.) Comments:	1	2	3	4	5	6	7
7. To what extent is there provision for data gathering, problem formulation, and estimation procedures? Comments:	1	2	3	4	5	6	7
8. To what extent are there simulations, joint projects and use of calculations? Comments:	1	2	3	4	5	6	7

TABLE 8
(continued)

9. To what extent does the kit meet the terms of contract with the Project Director?
Comments:
10. To what extent does the kit conform to specification guideline chart?
Comments:
11. To what extent is a rationale presented - how and why the kit was generated?
Comments:
12. To what extent is there explanation of how to use the kit (functions, effective settings)?
Comments:
13. To what extent is there appropriate record sheets and other learning management devices?
Comments:
14. To what extent does the placement test serve as a skill survey test with purpose of indicating strand student should begin study?
Comments:
15. To what extent is each activity controlled by an objective which is keyed to a mathematical strand?
Comments:

<i>virtually no evidence</i>	<i>some evidence</i>	<i>modest effort</i>	<i>less than adequate; needs more work</i>	<i>adequate</i>	<i>excellent; some revision</i>	<i>exemplary</i>
1	2	3	4	5	6	7
1	2	3	4	5	6	7
1	2	3	4	5	6	7
1	2	3	4	5	6	7
1	2	3	4	5	6	7
1	2	3	4	5	6	7
1	2	3	4	5	6	7

ATTITUDE/INTEREST TOWARDS MATH SCALE (AIMS)

ID _____

Class: Red Black

Sex: Male Female

Age: _____
 years months

Name: _____

DIRECTIONS:

There are no right or wrong answers. How you feel about a question is the answer you should put down. Read the statements and circle your choice.

		strongly disagree	disagree	undecided	agree	strongly agree
1.	Math is not very interesting.	1	2	3	4	5
2.	Math that you learn in school is useful outside of school.	1	2	3	4	5
3.	I would rather do some other subject than do math.	1	2	3	4	5
4.	Math can only be learned in school.	1	2	3	4	5
5.	I enjoy seeing how quickly and accurately I can do math problems.	1	2	3	4	5
6.	I enjoy working with real objects	1	2	3	4	5
7.	I like to figure out math problems in my own way.	1	2	3	4	5
8.	Math is my favorite subject.	1	2	3	4	5
9.	I don't enjoy doing hard math problems.	1	2	3	4	5
10.	I like to do math problems outside of school.	1	2	3	4	5
11.	I don't feel sure of myself in math.	1	2	3	4	5
12.	I am afraid of doing word problems.	1	2	3	4	5
13.	I would rather play math games than do worksheets.	1	2	3	4	5
14.	I don't do any math problems unless it's during math class.	1	2	3	4	5

TABLE 9
(continued)

		strongly disagree	disagree	undecided	agree	strongly agree
15.	Working with numbers is fun.	1	2	3	4	5
16.	Math is good because it makes you think.	1	2	3	4	5
17.	Math is too complicated.	1	2	3	4	5
18.	Math is logical..	1	2	3	4	5
19.	Math is necessary in daily life.	1	2	3	4	5
20.	There are too many steps needed in getting the answer to a problem.	1	2	3	4	5
21.	Math is practical.	1	2	3	4	5
22.	Most word problems are not practical.	1	2	3	4	5
23.	It is fun to play with numbers.	1	2	3	4	5
24.	There are too many rules to learn in mathematics.	1	2	3	4	5
25.	Discovering the solutions to mathematics is rewarding.	1	2	3	4	5

TABLE 10

INVENTORY OF KIT DEVELOPMENT SKILLS.

In order to develop a kit I need

- | |
|----------------------------------|
| 1 = no help |
| 2 = a little help |
| 3 = a moderate amount
of help |
| 4 = quite a bit of
help |

in the skills of:

Please circle choice.

- | | | | | |
|---|---|---|---|---|
| 1. Understanding how concepts and underlying principles from other curricular areas can be specifically integrated in the mathematics kits to be developed. | 1 | 2 | 3 | 4 |
| 2. Applying mathematics in real-life situations. | 1 | 2 | 3 | 4 |
| 3. Differentiating content to provide for individual differences. (e.g. development of "reteach" strategies). | 1 | 2 | 3 | 4 |
| 4. Sequencing the content to be taught at each level. | 1 | 2 | 3 | 4 |
| 5. Articulating a hierarchy of learning tasks. | 1 | 2 | 3 | 4 |
| 6. Including estimation and verification of answers in the kits. | 1 | 2 | 3 | 4 |
| 7. Stating behavioral outcomes for learners of varying abilities. | 1 | 2 | 3 | 4 |
| 8. Developing varied strategies for problem solving with reinforcement. | 1 | 2 | 3 | 4 |
| 9. Encouraging multiple approaches to solutions (appropriate to individual maturity/learning level). | 1 | 2 | 3 | 4 |
| 10. Varying strategies to meet individual differences of learners. | 1 | 2 | 3 | 4 |
| 11. Developing classroom climate that is pupil-centered rather than teacher-centered. | | | | |
| 12. Encouraging pupils to question and to seek answers, rather than merely give answers. | 1 | 2 | 3 | 4 |
| 13. Planning for using materials and media carefully. | 1 | 2 | 3 | 4 |
| 14. Coordinating a multi-media approach with the behavioral objectives of the mathematics program. | 1 | 2 | 3 | 4 |
| 15. Providing programmed and individualized materials on varying levels of difficulty. | 1 | 2 | 3 | 4 |
| 16. Providing for daily as well as periodic evaluation. | 1 | 2 | 3 | 4 |

24
TABLE 10
(continued)

17. Evaluating understanding of mathematical concepts, as well as evaluating operational skills.	1	2	3	4
18. Using diagnostic tests as an integral part of the program to aid in proper placing of pupils in learning sequences.	1	2	3	4
19. Using both teacher-made and standardized tests to determine achievement of pupils.	1	2	3	4
20. Incorporating pretests and posttests for specific units of material.	1	2	3	4

Adapted in part from Kohl, Caldwell, and Cichhorn; Self-Appraisal and Development of the Middle School, An Inservice Approach. The Pennsylvania School Study Council, Inc, 1970.

TABLE 11

INVENTORY OF KIT IMPLEMENTATION SKILLS

In order to implement a kit I need

-
- 1 = no help
 2 = a little help
 3 = a moderate amount of help
 4 = quite a bit of help
-

in the skills of:

Please circle choice.

- | | | | | |
|--|---|---|---|---|
| 1. encouraging students in the importance of mathematics. | 1 | 2 | 3 | 4 |
| 2. knowing enough about basic mathematics. | 1 | 2 | 3 | 4 |
| 3. motivating students in the use of kits. | 1 | 2 | 3 | 4 |
| 4. understanding the basic terminology used in kits.
(e.g., strands, placement tests, re-teach
strategies, etc.) | 1 | 2 | 3 | 4 |
| 5. classroom management - balancing time between
activities and practice. | 1 | 2 | 3 | 4 |
| 6. classroom management - various grouping strategies. | 1 | 2 | 3 | 4 |
| 7. classroom management - physical location and
access of kits. | 1 | 2 | 3 | 4 |
| 8. classroom management - general classroom atmosphere. | 1 | 2 | 3 | 4 |
| 9. record keeping - student progress forms. | 1 | 2 | 3 | 4 |
| 10. record keeping - systematic log of frequency of
kit use. | 1 | 2 | 3 | 4 |
| 11. record keeping - locus of implementation. | 1 | 2 | 3 | 4 |
| 12. interpreting pretest and posttest scores. | 1 | 2 | 3 | 4 |
| 13. using media materials. | 1 | 2 | 3 | 4 |

Table 12

INSTRUCTIONAL ACTIVITY SPECIFICATION GUIDELINE CHART

STRAND	Large Group Activity	Small Group Activity	(Practical) Independent Activity	(Simulated) Independent Activity
<u>ADDITION OF WHOLE NUMBERS</u> 1. Without regrouping 2. With regrouping 3. Zero principle <u>SUBTRACTION OF WHOLE NUMBERS</u> 1. Without regrouping 2. With regrouping 3. Zero principle <u>MULTIPLICATION OF WHOLE NUMBERS</u> 1. By single digit without regrouping 2. By single digit with regrouping 3. By multiples of 10 4. By two digit numeral without regrouping 5. By two digit numeral with regrouping <u>DIVISION OF WHOLE NUMBERS</u> 1. By a single digit divisor, no remainder 2. By a two digit divisor, no remainder 3. By a three digit divisor, no remainder 4. By a single digit divisor, no remainder 5. By a two digit divisor, with remainder 6. By a three digit divisor, with remainder 7. With any number of digits in divisor, with or without remainder				32

Table 12 (continued)

STRAND	Large Group Activity	Small Group Activity	(Practical) Independent Activity	(Simulated) Independent Activity
<u>FRACTIONS</u>				
1. Finding LCD of two or more fractions				
2. Writing fractions in lowest terms				
3. Writing mixed numbers as improper fractions				
4. Writing improper fractions as mixed numbers				
5. Adding common fractions with like denominators				
6. Adding common fractions with unlike denominators				
7. Adding mixed numbers with like denominators				
8. Adding mixed numbers with unlike denominators				
9. Subtracting common fractions, like denominators				
10. Subtracting common fractions, unlike denominators				
11. Subtracting mixed numbers, like denominators				
12. Subtracting mixed numbers, unlike denominators				
13. Subtracting mixed numbers, with regrouping				
14. Multiplying two common fractions				
15. Multiplying a common fraction (or mixed number) with a whole number				
16. Multiplying a common fraction with a mixed number				
17. Multiplying two mixed numbers				
18. Dividing a whole number by a fraction and a fraction by a whole number				
19. Dividing a fraction by a fraction				
20. Dividing a mixed number by a fraction and a fraction by a mixed number				
21. Dividing a mixed number by a mixed number				

Table 12 (continued)

STRAND	Large Group Activity	Small Group Activity	(Practical) Independent Activity	(Simulated) Independent Activity
<u>DECIMALS</u>				
1. Converting common fractions to decimals				
2. Converting decimals to common fractions				
3. "Rounding off" numbers				
4. Adding decimals				
5. Subtracting decimals				
6. Multiplying a whole number by a decimal				
7. Multiplying two decimals				
8. Dividing a decimal by a whole number				
9. Dividing a whole number by a decimal				
10. Dividing a decimal by a decimal				
<u>PERCENT</u>				
1. Converting a decimal to a percent				
2. Converting a percent to a decimal				
3. Converting a common fraction to a percent				
4. Converting a percent to a common fraction				
5. Finding a percentage of a number				
6. Finding what percent one number is of another				
7. Finding a number when a percent of it is given				
8. Working with percents less than 1%				
9. Working with percents greater than 100%				
<u>RATIO & PROPORTION</u>				
1. Define and write ratios as fractions				
2. Define and write proportions				
3. Solve proportions				

Table 12 (continued)

STRAND	Large Group Activity	Small Group Activity	(Practical) Independent Activity	(Simulated) Independent Activity
<u>USE OF MONEY</u>				
1. Value				
2. Addition				
3. Subtraction				
4. Multiplication				
5. Division				
<u>MEASUREMENT: Metric & Standard</u>				
1. Time				
2. Temperature				
3. Capacity				
4. Weight				
5. Distance				
<u>GEOMETRIC MEASUREMENT</u>				
1. Perimeter				
2. Area				
3. Volume				

TABLE 13

STUDENT TOPICAL INTEREST INVENTORY

DIRECTIONS: As your teacher reads the following activities, place a check () before each one that you wish to express a strong interest. If you are interested in any activity that is not listed, please print it in the blank marked "other" at the end of that particular column.

Student: _____

Grade: _____

Reading Teacher: _____

SEASONAL SPORTS

☐ football
☐ basketball
☐ track
☐ baseball
☐ wrestling
☐ fishing
☐ hunting
☐ roller skating
☐ ice skating
☐ snow skiing
☐ water skiing
☐ sled riding
☐ swimming
☐ hiking
☐ jogging
☐ bike riding
☐ motorcycling
☐ minibiking
☐ walking
☐ tennis
☐ horseback riding
☐ karate
☐ golf
☐ skateboarding
☐ motor boating
☐ gymnastics
☐ auto racing
☐ horse racing
☐ sailing

Other: _____

HOBBIES

☐ cooking
☐ sewing
☐ small engine
 repair
☐ stamp collecting
☐ coin collecting
☐ antiques
☐ model building
☐ gardening
☐ stereo sound
 systems
☐ radio repair
☐ bear can
 collecting
☐ painting
☐ chess
☐ card collecting:
 baseball
 football
 rock groups
☐ Star Wars
☐ C.B. radio

Other: _____

CAREER SPECIAL INTERESTS

☐ doctor
☐ nurse
☐ medical technician
☐ chemist
☐ veterinarian
☐ automotive mechanic
☐ factory machinist
☐ teacher
☐ beautician
☐ social worker
☐ law enforcement
 person
☐ postal service worker
☐ fireman
☐ home economist
☐ food service worker
☐ farmer
☐ wildlife manager
☐ ecologist
☐ carpenter
☐ plumber
☐ electrician
☐ painter
☐ construction equip-
 ment operator
☐ truck driver
☐ architect
☐ salesman
☐ secretary
☐ business manager
☐ computer operator
☐ lawyer
☐ musician
☐ actor/actress

Other: _____

FREE TIME ACTIVITIES

Music:

☐ rock & roll
☐ country & western
☐ classical
☐ rhythm & blues
☐ jazz
☐ folk

Community:

☐ 4-H
☐ Boy Scouts
☐ Girl Scouts
☐ Little League
☐ Pony League
☐ Little Cardinal
☐ YMCA
☐ YWCA
☐ church youth
 group

Other: _____

Now go back and double check () eight (8) activities of your highest interest before returning your paper to your reading teacher. Thank you.